

# INDUCTIVELY COUPLED METHOD AND APPARATUS OF COMMUNICATING WITH WELLBORE EQUIPMENT

## CROSS REFERENCE TO RELATED APPLICATION

This is a divisional of U.S. Serial No. 09/859,944, filed May 17, 2001, <sup>now US 6,684,952</sup> which is a  
 continuation-in-part of U.S. Serial No. 09/784,651, filed February 15, 2001, <sup>now abandoned</sup> which claims  
 the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Application Serial No.  
 60/212,278, filed June 19, 2000, and which is a continuation-in-part of U.S. Serial No.  
 09/196,495, filed November 19, 1998, <sup>now US 6,209,648</sup>

## BACKGROUND

The invention relates to an inductively coupled method and apparatus of communicating with wellbore equipment.

A major goal in the operation of a well is improved productivity of the well. The  
 5 production of well fluids may be affected by various downhole conditions, such as the  
 presence of water, pressure and temperature conditions, fluid flow rates, formation and  
 fluid properties, and other conditions. Various monitoring devices may be placed  
 downhole to measure or sense for these conditions. In addition, control devices, such as  
 flow control devices, may be used to regulate or control the well. For example, flow  
 10 control devices can regulate fluid flow into or out of a reservoir. The monitoring and  
 control devices may be part of an intelligent completion system (ICS) or a permanent  
 monitoring system (PMS), in which communications can occur between downhole  
 devices and a well surface controller. The downhole devices that are part of such systems  
 are placed in the well during the completion phase with the expectation that they will  
 15 remain functional for a relatively long period of time (e.g., many years).

To retrieve information gathered by downhole monitoring devices and/or to  
 control activation of downhole control devices, electrical power and signals may be  
 communicated down electrical cables from the surface. However, in some locations of  
 the well, it may be difficult to reliably connect electrical conductors to devices due to the  
 20 presence of water and other well fluids. One such location is in a lateral branch of a